Monitoring and Evaluating Long-Term Population Trends of Small Landbirds on Ft. Riley, Kansas 1991-2000

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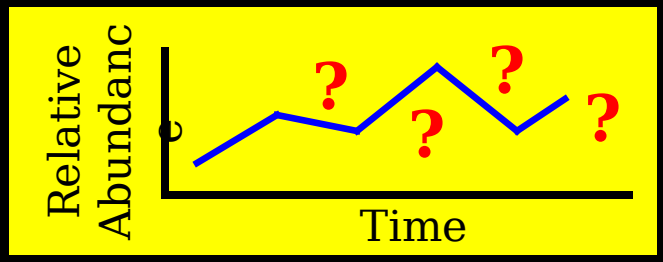
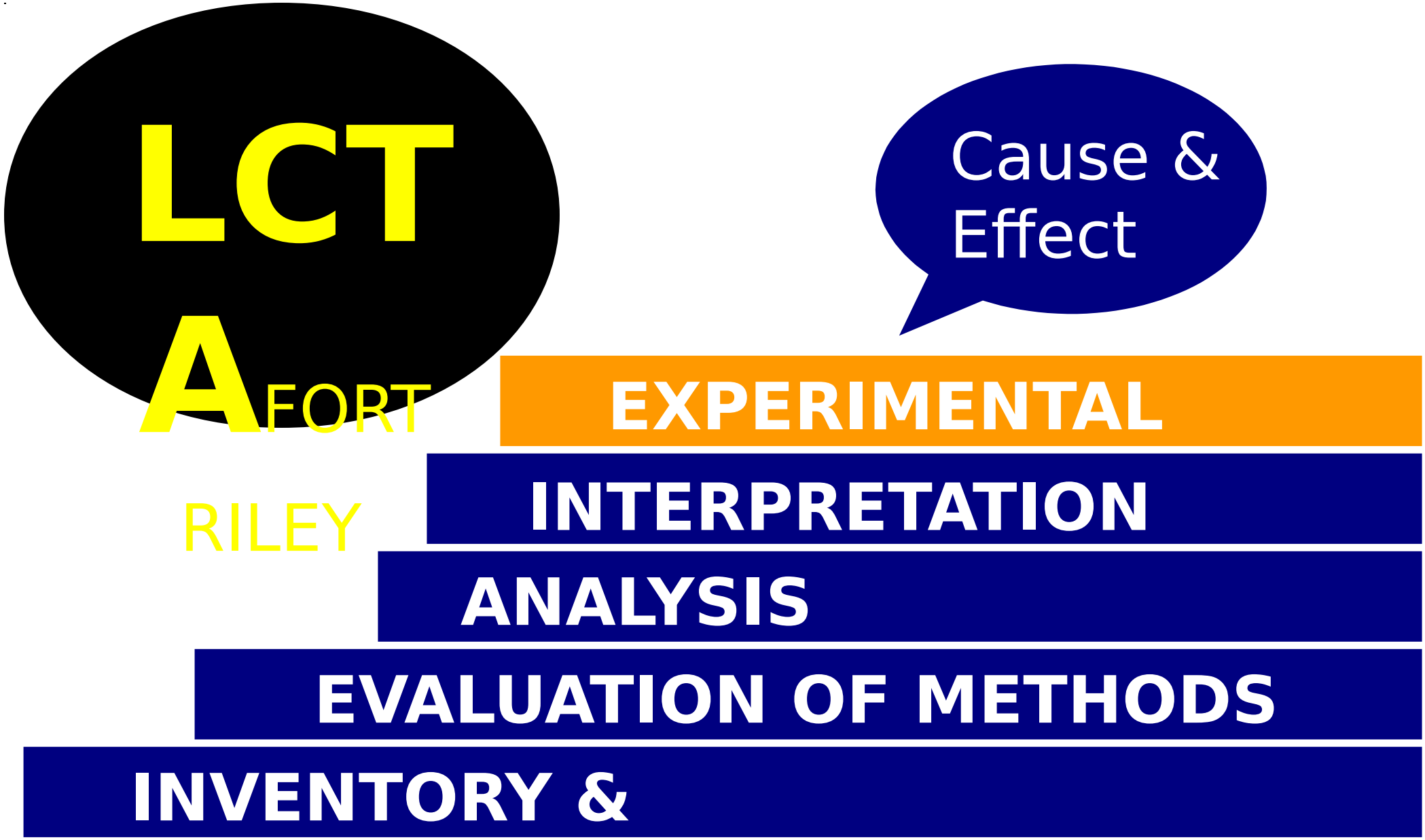
ITAM Conference



LCTA - Kansas Co-Op Unit - KSU

- **Don Althoff - KSU Coop Unit.**
- **Jim Rivers - KSU Coop Unit**
- **Phil Gipson - KSU Coop Unit**
- **Jeff Pontius - KSU Dept. Statistics**
- **Phil Woodford - ITAM Coordinator**


LCT
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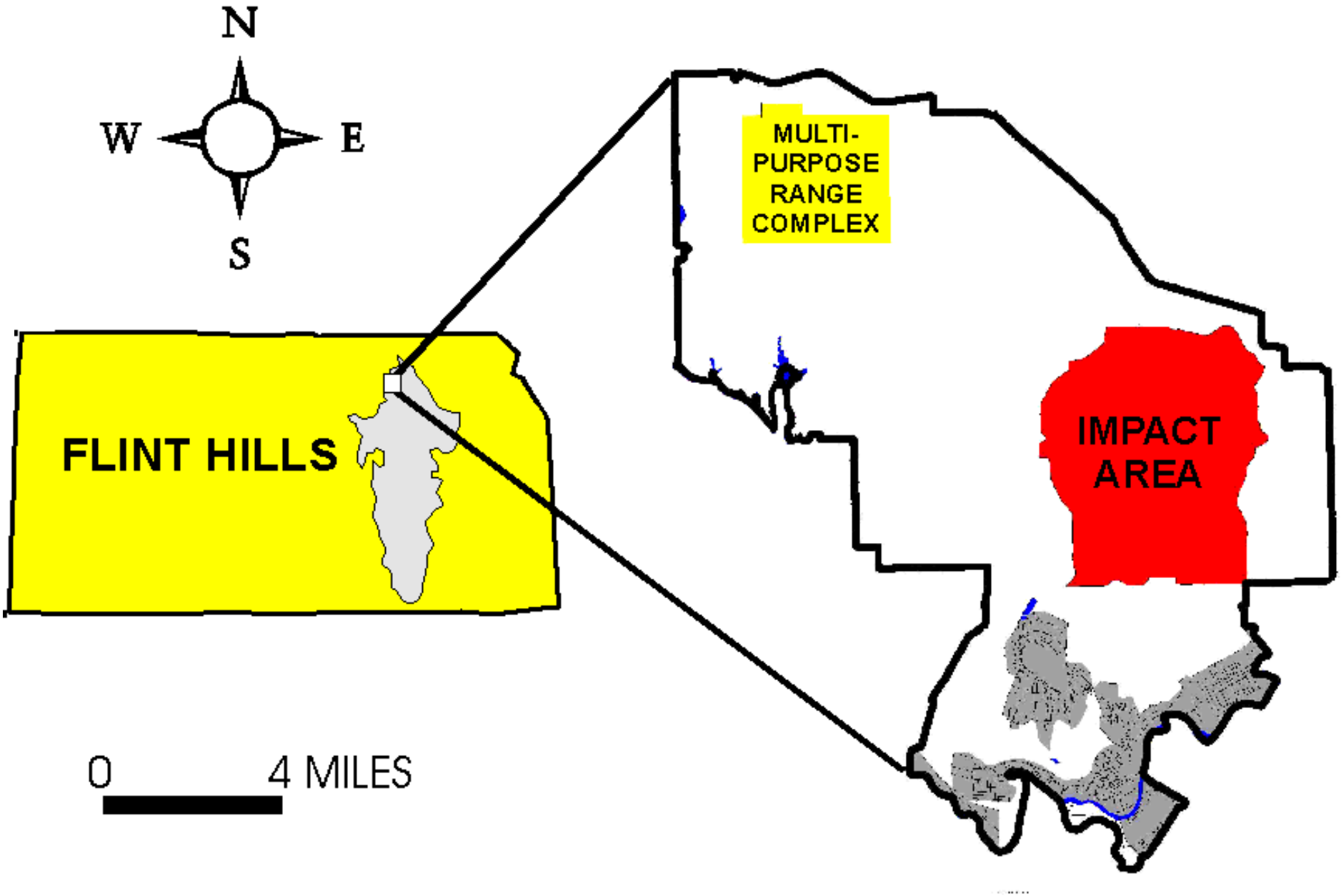

N
W
E
S
MULTI-
PURPOSE
RANGE
COMPLEX
FLINT HILLS
IMPACT
AREA
0
4 MILES

“STANDARD” Methodology

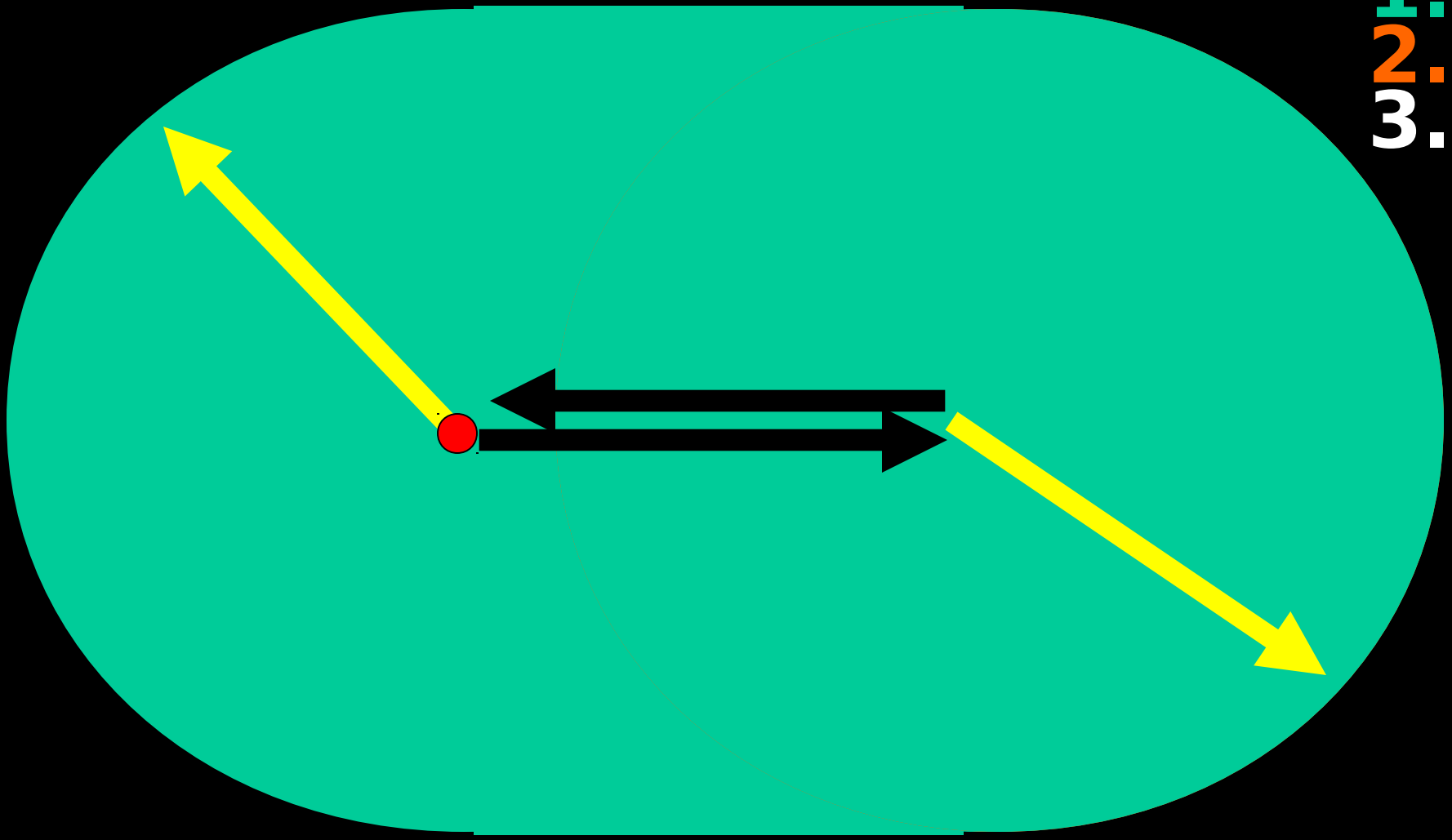
- 160 “PERMANENT” plots established a) representative of major habitats b) vegetation data collected annually
- 60 plots identified as “WILDLIFE” plots a) subset of 160 b) bird & small mammal surveys conducted annually

Bird Surveys

- Started in 1990
- Surveys started in late May/early June... based on arrival of dickcissels in area
- AM & PM surveys 1990 - 1999 AM-only starting in 2000
- All species seen or heard during observation period within sampling unit were recorded

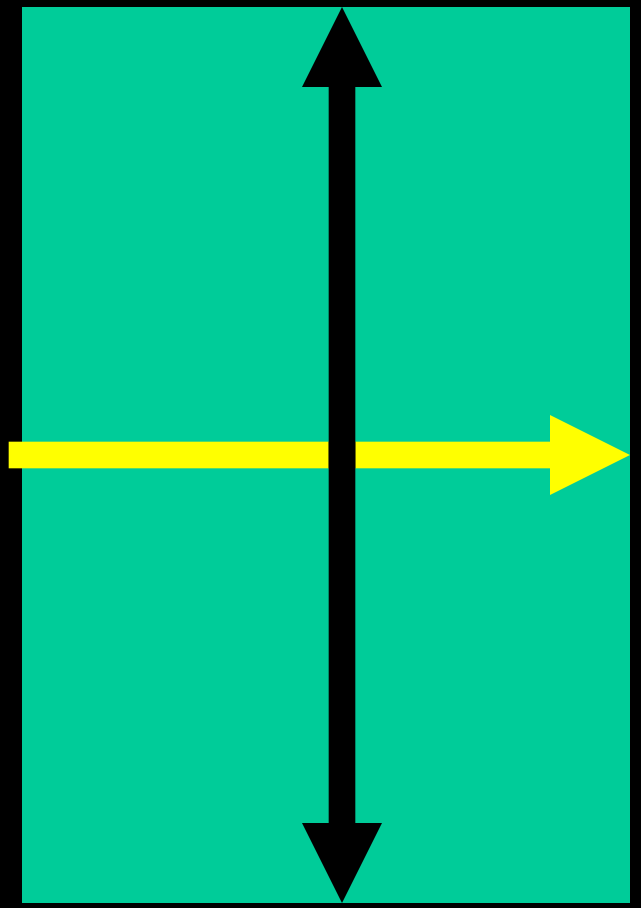
STRIP- POINT COUNT- STRIP METHOD

1. OUT
2. END
3. IN

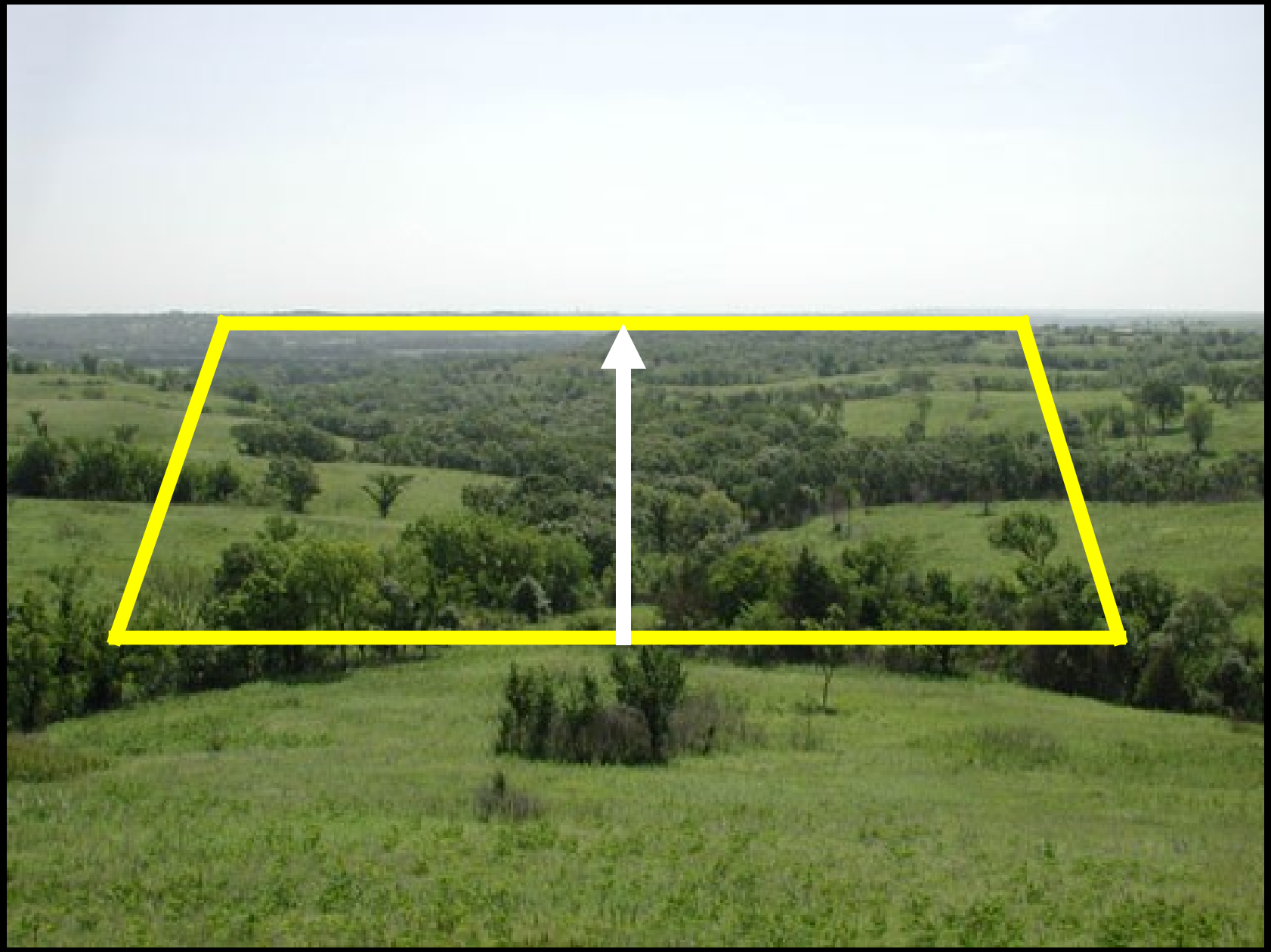


STRIP-TRANSECT (100 x 200m)

OUT-segment only



6-minute observation



Field Methods...

- “Out” Segments Used
- AM counts only, “good” conditions only
- 59-60 plots sampled annually
- Same observer for all plots in a given year....4 observers over 10-year period

Data Analysis
SMALL LANDBIRDS (<250 g)

- Excluded waterfowl, shorebirds, raptors, swifts, swallows and galliformes birds ... *species not likely to have breeding territories within size of sampling unit*

- Excluded species detected ≤3 years ...*in all cases this resulted in exclusion of species detected ≤ 5 plots total for 10-year period...*for population trends

Data Analysis

Although population density *"could"* have been used and diversity indices (i.e., Shannon-Weaver *H'*, Simpson's *D*) generated....we had concerns:

- Unequal detectability across species
- Unequal detectability within a species--male vs. female
- Different observers across years
- Changes in methodology (1991-1998 vs. 1999-2000)
- **"Combo" methodology: strip transect + point count**

Data Analysis…con’t

Used PRESENCE-ABSENCE…

….for a species on a plot

Bart, J., and S. P. Klosiewski. 1989. Use of presence-absence to measure changes in avian density. Journal of Wildlife Management 53:847-852.

Using PRESENCE-ABSENCE

- TOTAL SPECIES RICHNESS --total number of species observed over all plots

- MEAN SPECIES RICHNESS/-PLOT --number of species detected per plot, average of all plots

- SPECIES-by-SPECIES --proportion of plots $\geq$ 1 individual detected per plot

SPECIES-by-SPECIES

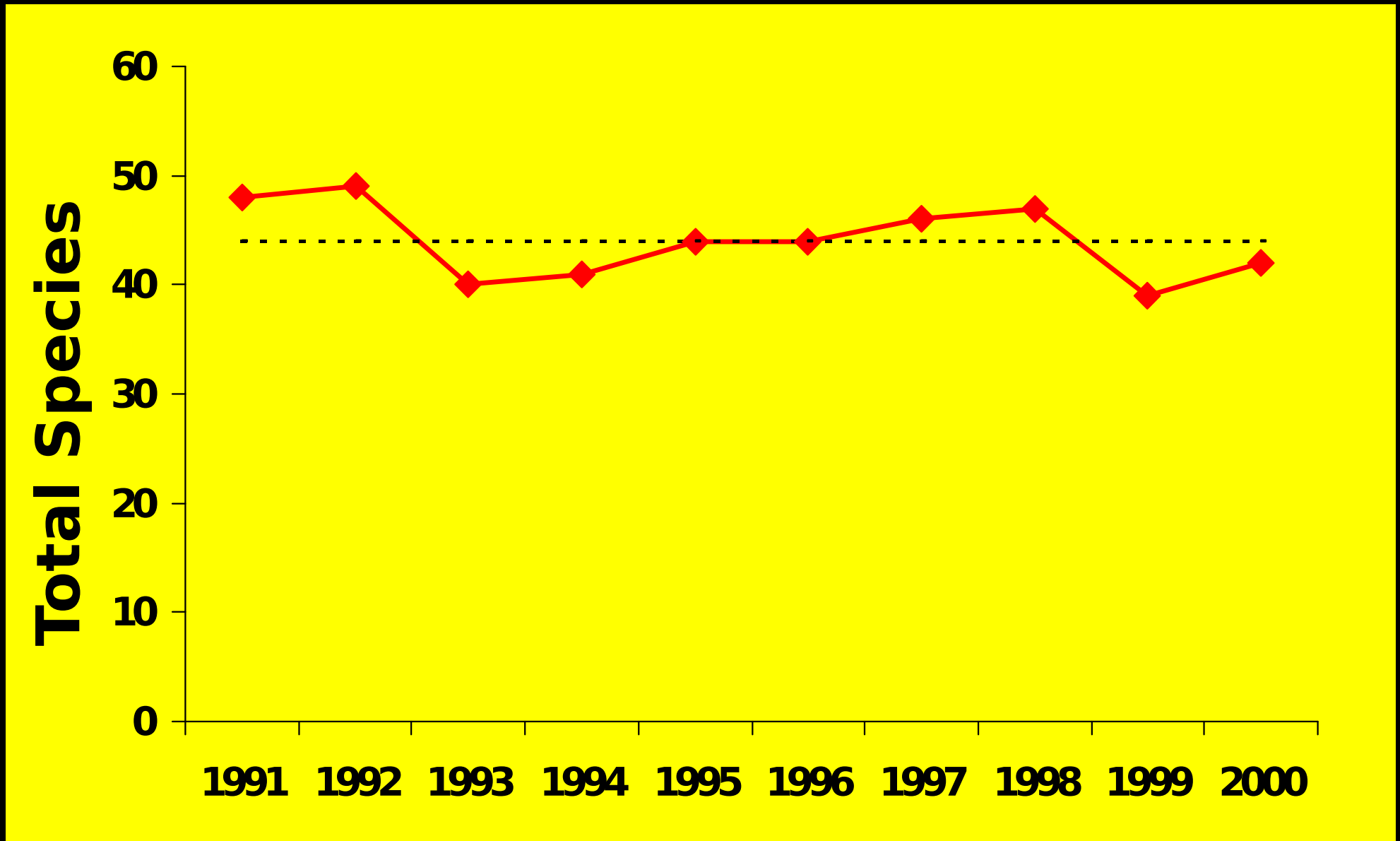
- Graphic analysis: **LOWESS**
- Numerical analysis: **RELATIVE TREND**

RTI

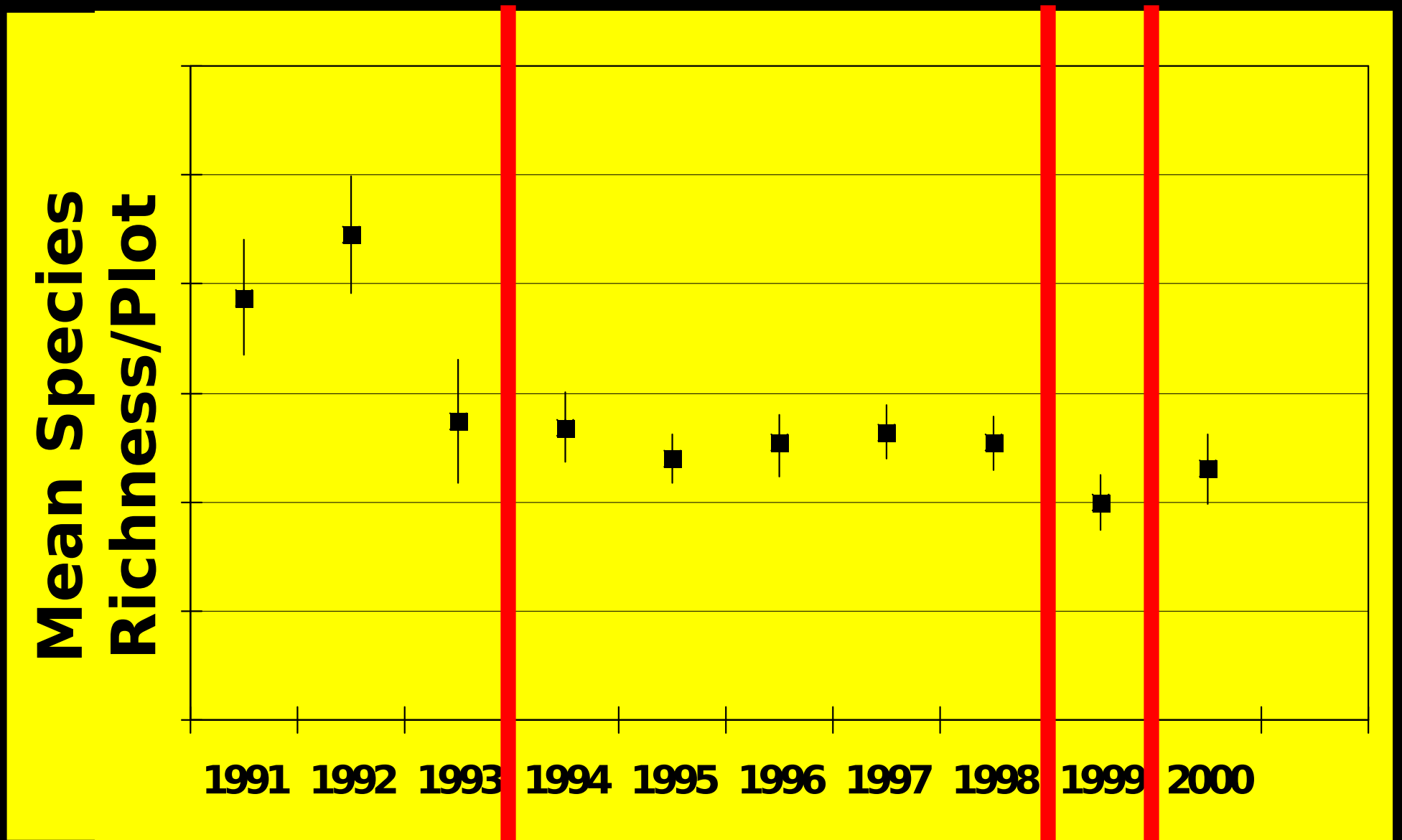
Analysis - Key Questions

- Why PRESENCE-ABSENCE?
- Why SPECIES RICHNESS?
- Why TRENDS?

Total Species Richness



Mean Species Richness



Bird Species categorized by

HABITAT

- GRASSLAND
- SHRUBLAND
- WOODLAND

MIGRATION

- RESIDENTS
- SHORT-DISTANCE
- LONG-DISTANCE

Robust Locally Weighted Regression

“….data smoothing procedure”

Locally-

Or

Weighted

E

Scatterplot

Smoothing

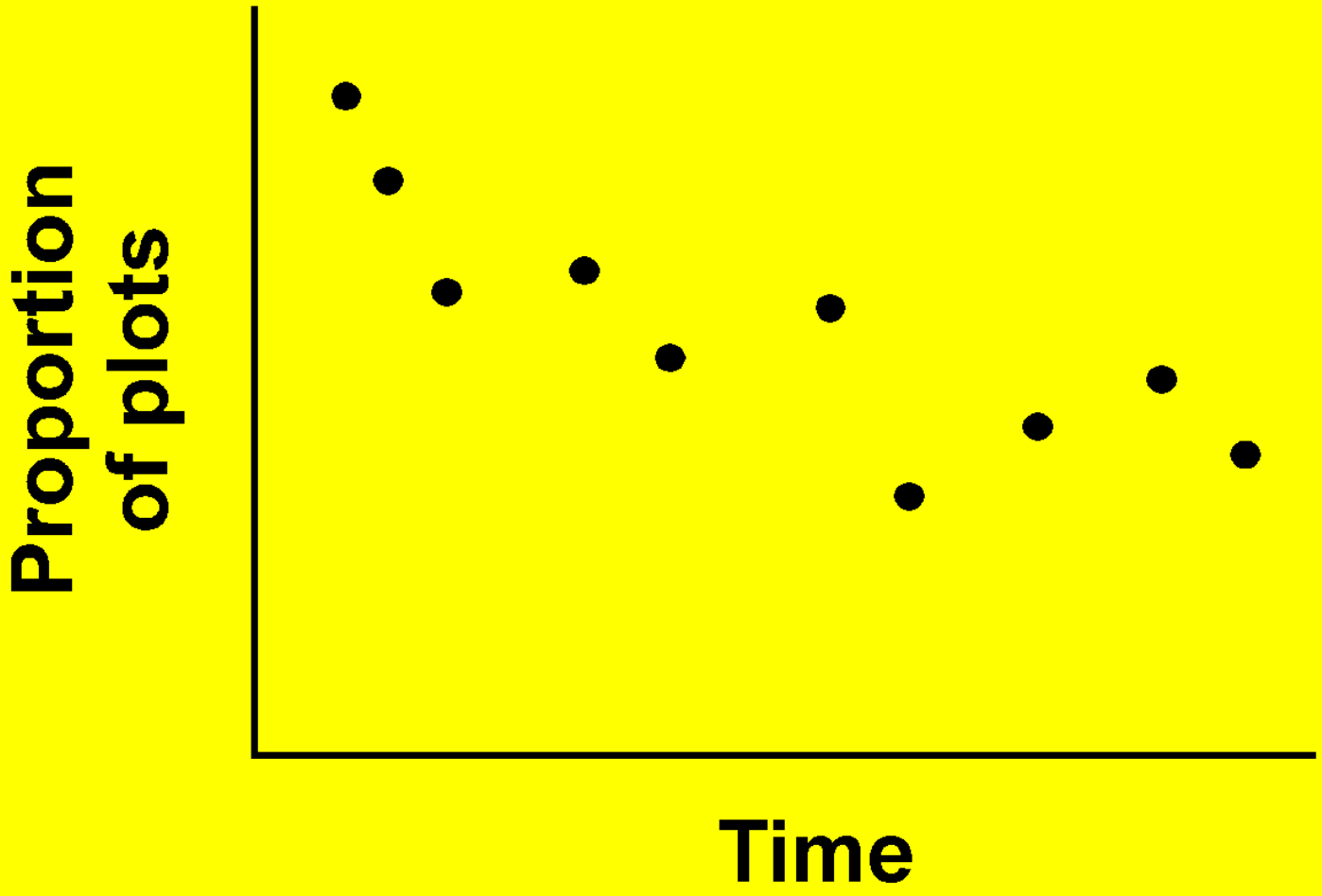
Robust Locally Weighted Regression

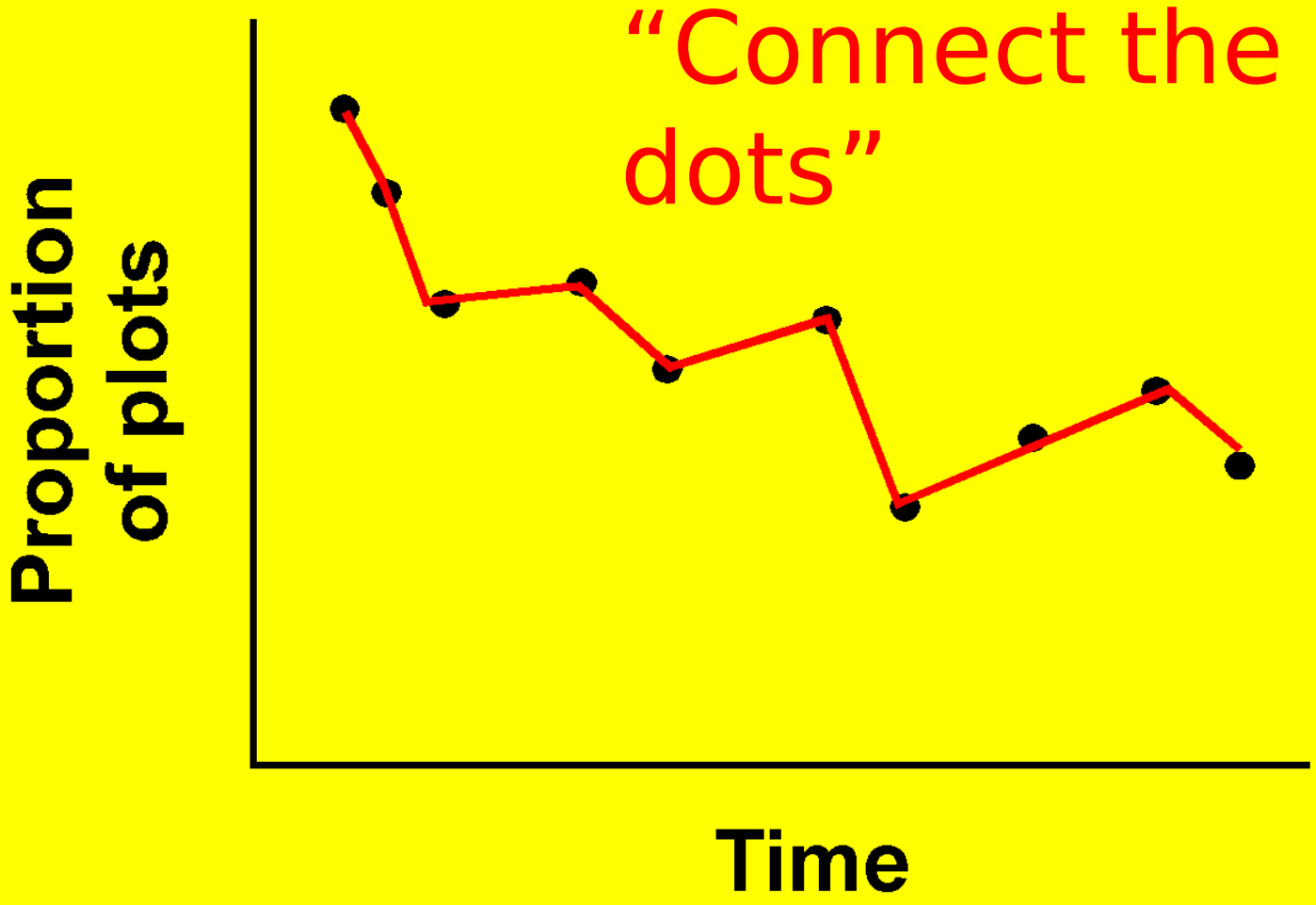
"....data smoothing procedure"

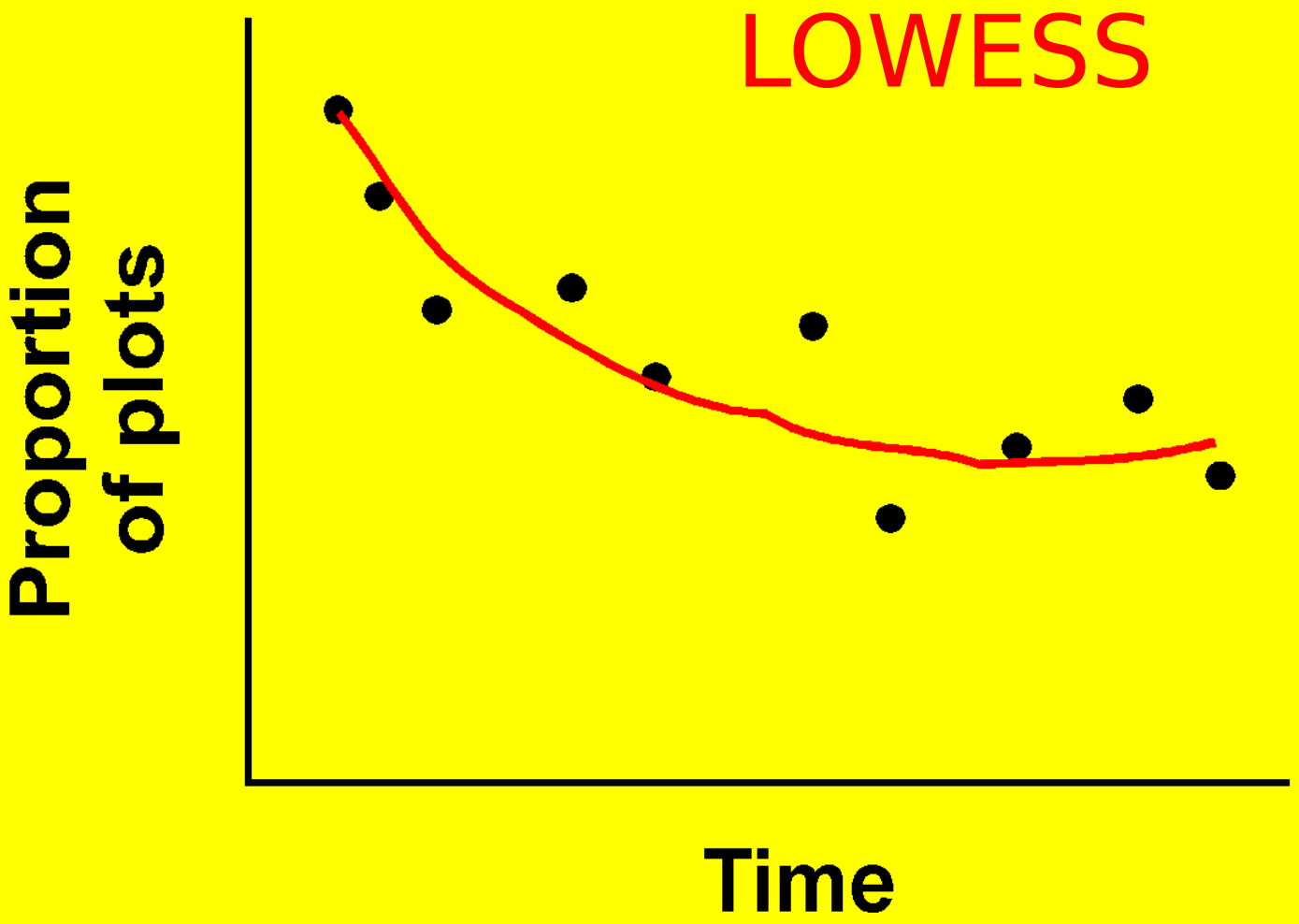
LOWESS

Cleveland, W.S. 1985. The elements of graphing data. Wadsworth Advanced Books and Software, Monterey, California.

James, F.C., C. E. McCulloch, and D.A. Wiedenfeld. 1996. New approaches to the analysis of population trends in landbirds


Proportion
of plots
Time


“Connect the dots”
Proportion of plots
Time


LOWESS
Proportion of plots
Time

Dickcissel

GRASSLAND

LOWESS

Grasshopper Sparrow

GRASSLAND

Meadowlarks (E & W)

GRASSLAND

Brown-headed Cowbird

GRASSLAND

Mourning Dove

GRASSLAND

Upland Sandpiper

GRASSLAND

Henslow’s Sparrow

GRASSLAND

Common Yellowthroat

GRASSLAND

Northern Cardinal

SHRUBLAND

Brown Thrasher

SHRUBLAND

Eastern Kingbird

SHRUBLAND

Gray Catbird

SHRUBLAND

Bell’s Vireo

SHRUBLAND

Blue Jay

WOODLAND

Field Sparrow

WOODLAND

Yellow-billed Cuckoo

WOODLAND

House Wren

WOODLAND

Black-Capped Chickadee

WOODLAND

Red-bellied Woodpecker

WOODLAND

Species With **DECLINING** Trend

- Meadowlarks
- Mourning Doves
- Upland Sandpipers
- Nighthawk
- E. Kingbird
- Cardinal
- B. Thrasher
- Blue Jay
- Field Sparrow
- Y.B. Cuckoo
- B.C. Chickadee
- C. Grackle
- R-B Woodpecker
- N. Flicker

RELATIVE TREND INDEX

$$RTI = \frac{(\hat{P}_{t+1} - \hat{P}_1)}{\sum_{j=1}^{t-1} \left| (\hat{P}_{j+1} - \hat{P}_j) \right|}$$

t = number of years

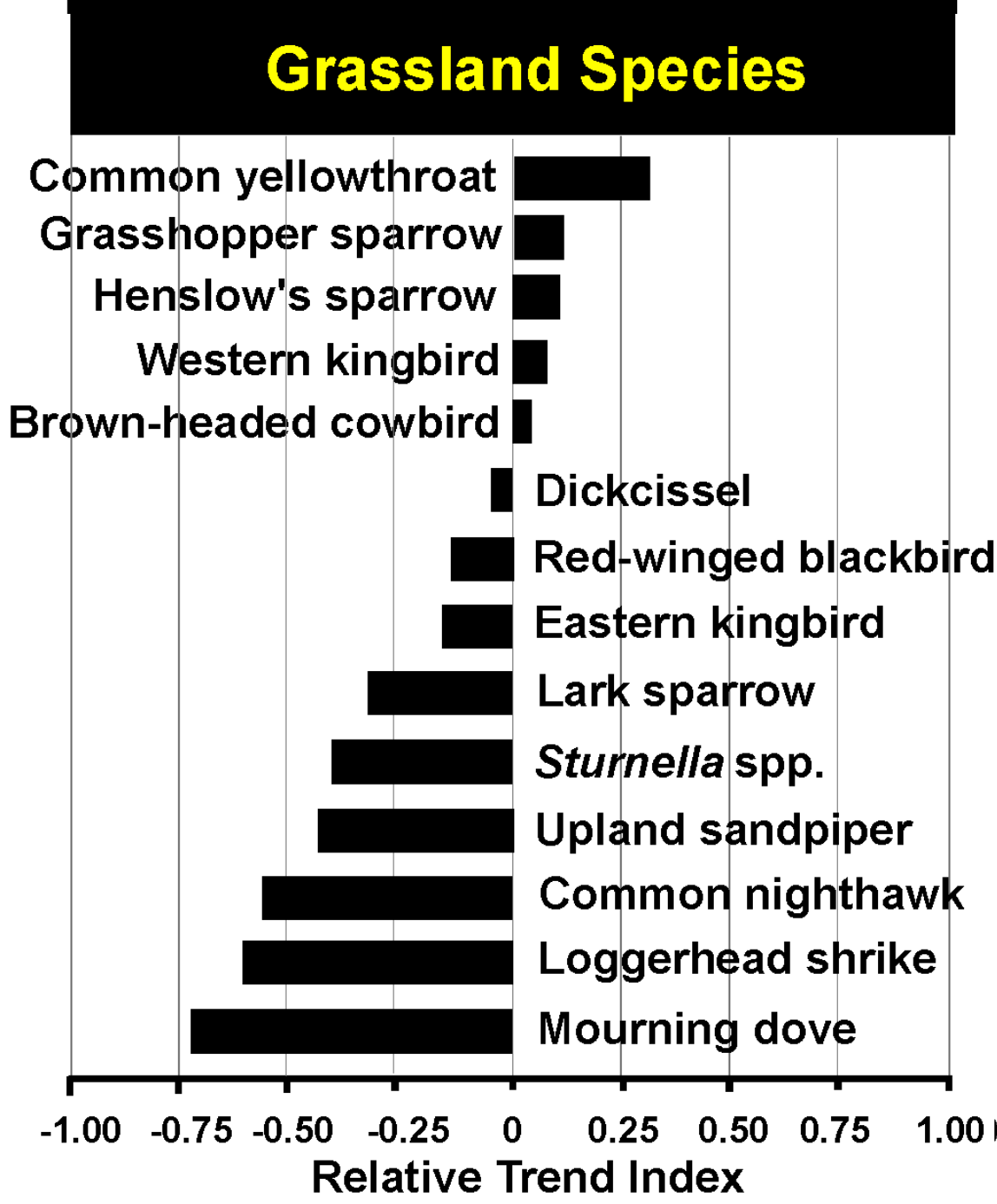
j = time (year)

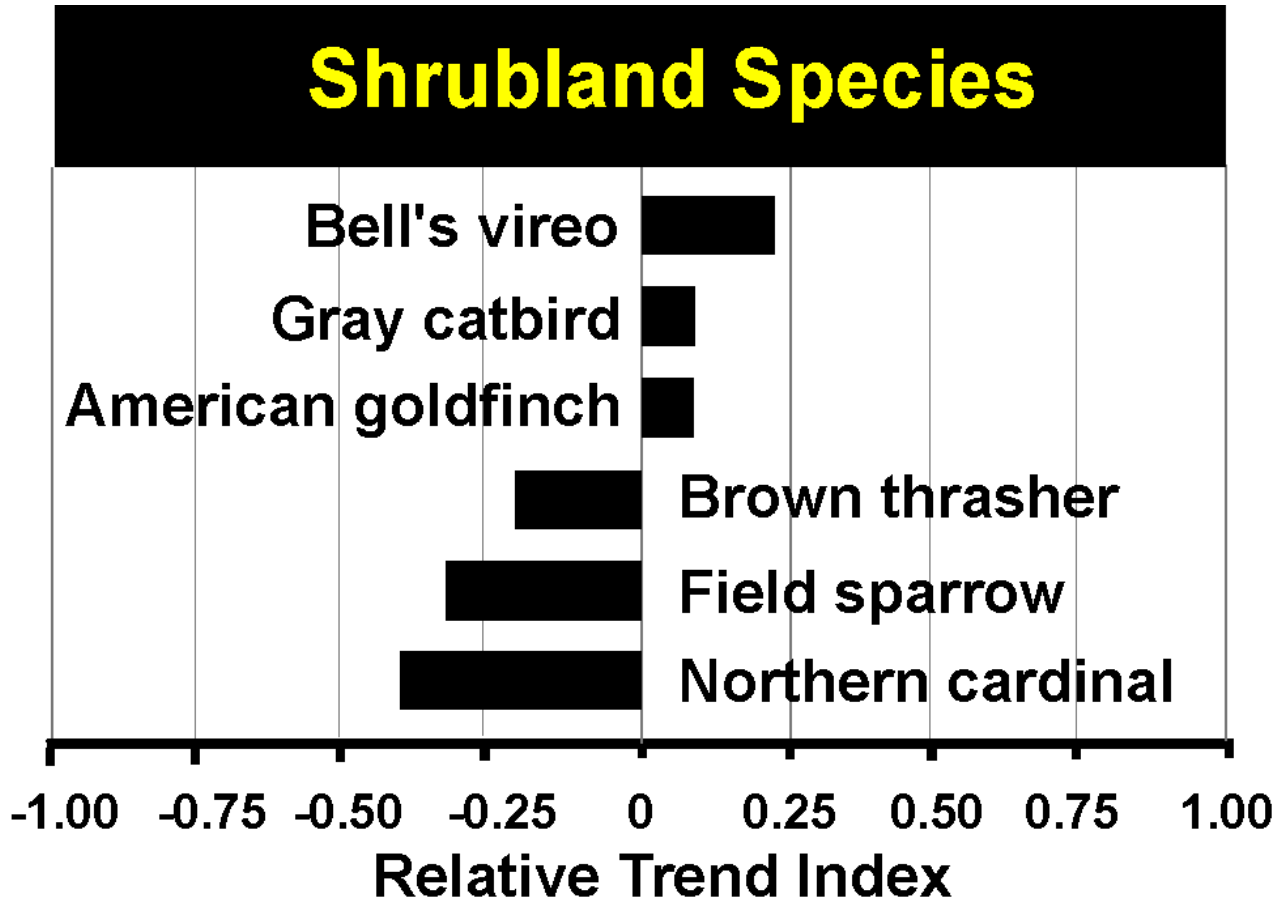
$\hat{P}_j$ = proportion of plots on which a species was observed in j years

RELATIVE TREND INDEX

$$RTI = \frac{(\hat{P}_{t+1} - \hat{P}_1)}{\sum_{j=1}^{t-1} \left| (\hat{P}_{j+1} - \hat{P}_j) \right|}$$

-1 < RTI < 1


Grassland Species
Common yellowthroat
Grasshopper sparrow
Henslow's sparrow
Western kingbird
Brown-headed cowbird
Dickcissel
Red-winged blackbird
Eastern kingbird
Lark sparrow
Sturnella spp.
Upland sandpiper
Common nighthawk
Loggerhead shrike
Mourning dove
-1.00
-0.75
-0.50
-0.25
0
0.25
0.50
0.75
1.00
Relative Trend Index


Shrubland Species
Bell's vireo
Gray catbird
American goldfinch
Brown thrasher
Field sparrow
Northern cardinal
-1.00
-0.75
-0.50
-0.25
0
0.25
0.50
0.75
1.00
Relative Trend Index

TRENDS

Total Species Richness STEADY

Mean Species Richness DECLINING

Grassland species ST, DE, 1-IN

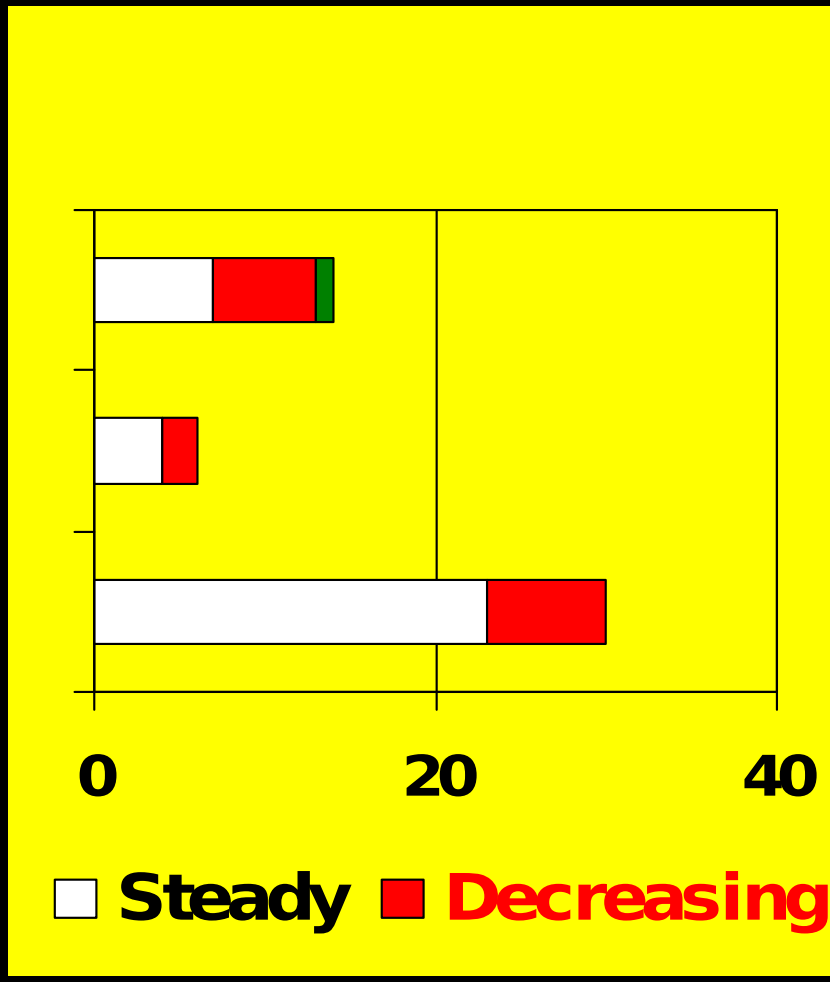
Shrub/herb species ST or DE

Woodland species steady ST or DE

ONLY 1 SPECIES SHOWING INCREASES !

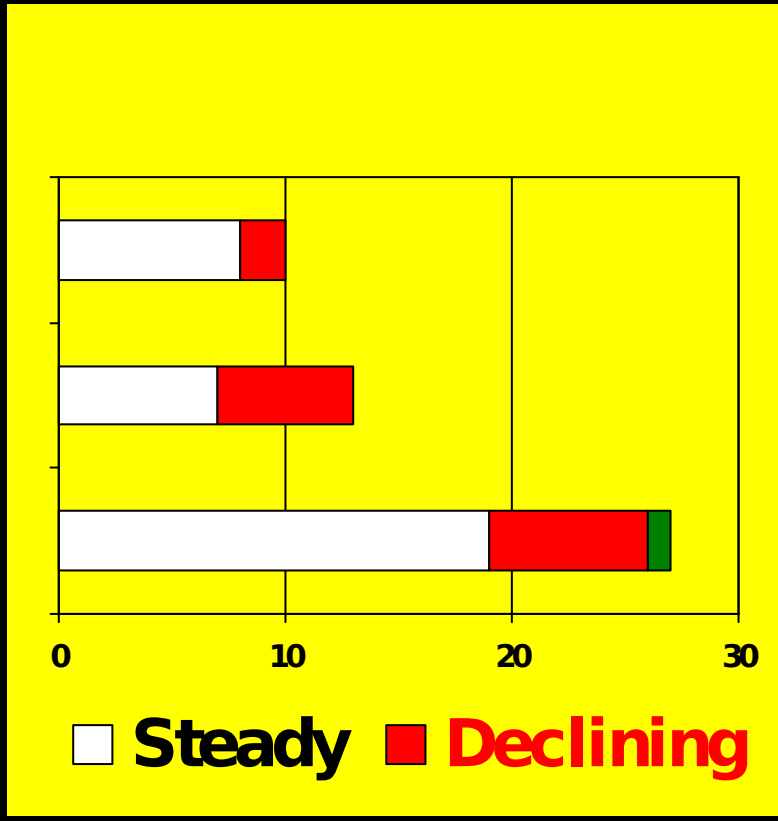
Habitat Association

	Steady	Declining	
Grassland	7		6
Shrub-herb	4		2
Woodland	23	7	
TOTAL	34		15



Migration Status

	Steady	Declining
Residents	8	2
Short-distance	7	6
Long-distance	19	7



TRENDS

Total Species Richness STEADY

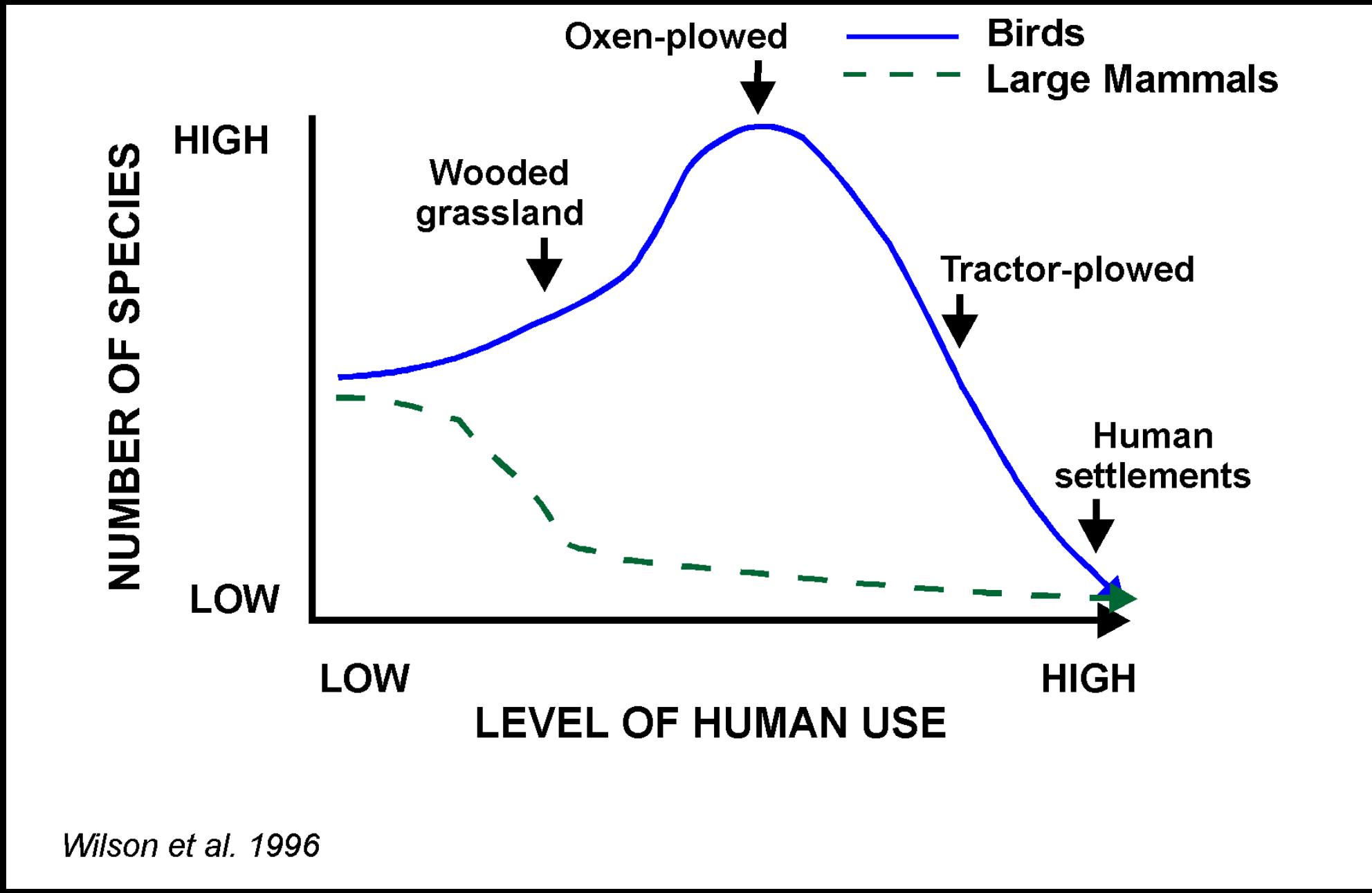
Mean Species Richness DECLINING

Grassland species ST, DE, IN

Shrub/herb species ST or DE

Woodland species steady ST or DE

Just **1** SPECIES SHOWING AN INCREASE !



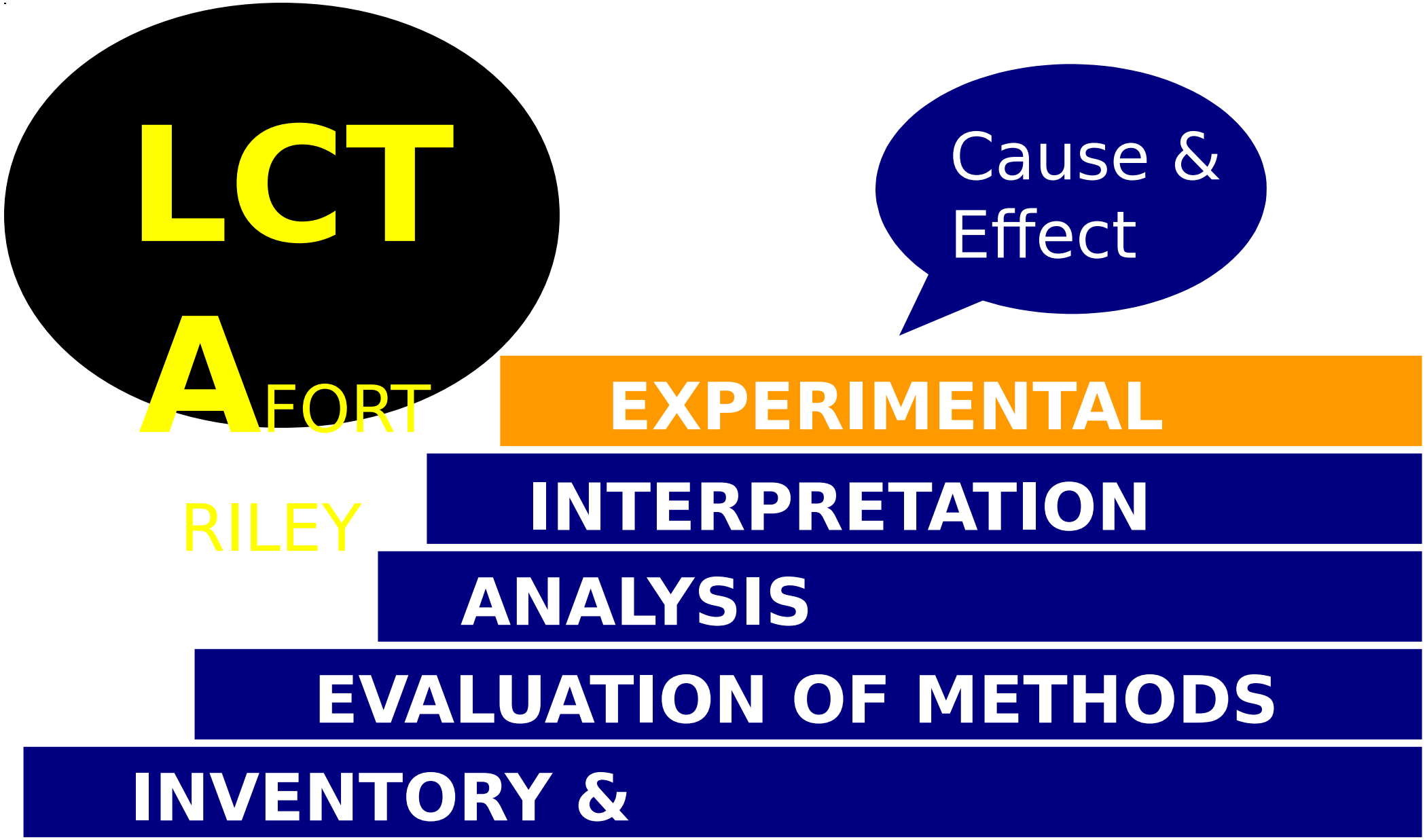
Wilson et al. 1996

What's going on disturbance-wise?

- Military training - short & long term
- Burning
- Haying
- Timber harvest

What’s being impacted?

- Soils - compacted ?
- Vegetation - productivity decreased ?
- Vegetation - species composition ?
- Vegetation - alien plant invasions ?
- Birds - productivity decreased ?
- ????


LCT
AFORT
RILEY
Cause &
Effect
EXPERIMENTAL
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ANALYSIS
EVALUATION OF METHODS
INVENTORY &

Summary - Community Trends

- COMMUNITY MEASURES helpful for detecting dramatic loss/gain in diversity
- MEAN SPECIES RICHNESS/PLOT more sensitive measure of pending loss/gain in diversity than TOTAL SPECIES RICHNESS
- ANALYSIS BY ASSEMBLAGES highlights groups most at risk

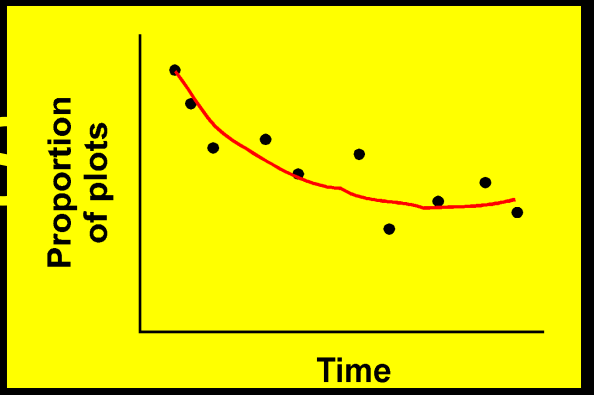
Summary - Species Trends

- PRESENCE-ABSENCE analysis is "conservative" yet revealing!
- LOWESS & RTI provide objective interpretation of population trends
- IDENTIFICATION OF DECLINING SPECIES allows prioritization and direction of future research/monitoring

Summary - PRESENCE-ABSENCE

- **Conservative approach….not as influenced by potential for observer bias**
- **No loss of data…can retain actual counts**
- **Highlight “major” trends…year-to-year fluctuations don’t mask overall trend**

Summary - LOWESS



- **Use PRESENCE-ABSENCE data**
- **Applies statistically-based, graphical representation of the trend…superior to “connect-the-dots”**

Summary RTI

-1 < RTI < 1

- **Use PRESENCE-ABSENCE data … or other measures**
- **Numerical summary of trend**
- **Directional indicator of trend**
- **Same scale for all species, regardless of abundance, providing for objective identification species in need of additional management consideration**

Parting shots….

- Evaluate methodology
- Interpret data sets with graphical as well as numerical approaches
- Use “understandable” trend data to…
  a) update managers of land condition
  b) identify focused monitoring needs

The trends of common species should not be overlooked...when their populations are decreasing it is likely a clear indication the condition of the land is declining.